Piezoelectric Washer for Accurate Application of Bolt Preload

Completed Technology Project (2015 - 2016)

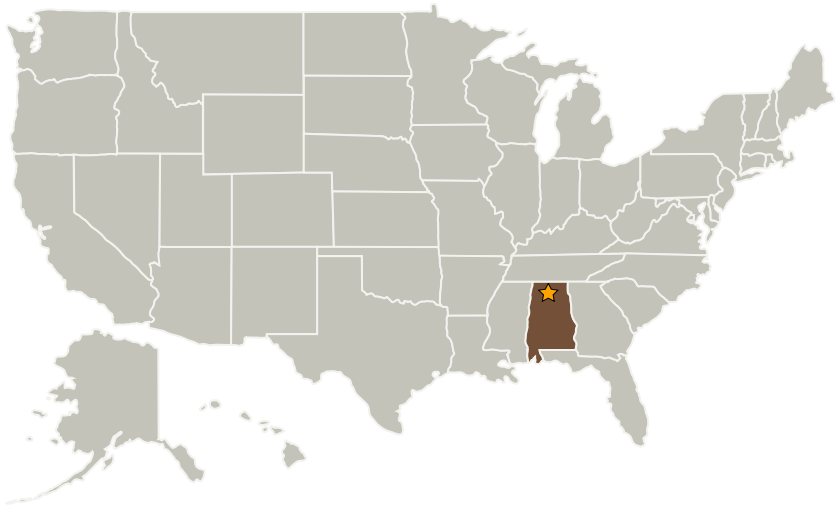
Project Introduction

A concept is proposed for monitoring bolt preload that offers accuracy and low-cost features not available in existing preload monitoring systems. Existing washer size and load carrying capability information will be used to initiate the design. The goal is to retrofit the proposed Piezoelectric Fiber Composite Washer (PFCW) into a fastener assembly. PFCW prototypes will be fabricated using 3D printing technology. Comprehensive laboratory tests will be conducted to determine the load-voltage relationship. A prototype of a handheld device will be developed to demonstrate the real-time preload monitoring by relating the load to the collected voltage in the piezoelectric materials.

Anticipated Benefits

Develop a low-cost method to accurately measure the preload in a structural bolt assembly for spaceflight missions.

Primary U.S. Work Locations and Key Partners



Piezoelectric Washer for Accurate Application of Bolt Preload

Table of Contents

Piezoelectric Washer for Accurate Application of Bolt Preload

Completed Technology Project (2015 - 2016)

Organizations Performing Work	Role	Type	Location
★Marshall Space Flight Center(MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
University of Alabama in Huntsville(UAH)	Supporting Organization	Academia	Huntsville, Alabama

Primary U.S. Work Locations
Alabama

Project Website:

https://www.nasa.gov/directorates/spacetech/home/index.html

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Marshall Space Flight Center (MSFC)

Responsible Program:

Center Innovation Fund: MSFC CIF

Project Management

Program Director:

Michael R Lapointe

Program Manager:

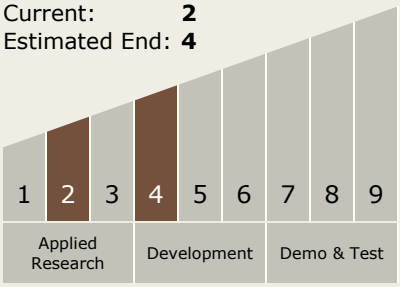
John W Dankanich

Principal Investigator:

David A Hissam

Technology Maturity (TRL)

Start: **2**
Current: **2**
Estimated End: **4**



Piezoelectric Washer for Accurate Application of Bolt Preload

Completed Technology Project (2015 - 2016)

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.3 Mechanical Systems
    - TX12.3.2 Electro-Mechanical, Mechanical, and Micromechanisms